

## CLAIMS

### WE CLAIM:

1. A grating based line narrowing device for line narrowing a laser producing high energy laser beams, said device comprising:
  - (A) a grating defining a grating face,
  - (B) a chamber for housing at least said grating,
  - (C) a helium source for providing a helium purge for purging said chamber,
  - (D) a beam expanding means for expanding a beam from said laser to produce an expanded beam,
  - (E) a tuning means for directing said expanded beam onto the grating face in order to select from said expanded beam a desired range of wavelengths.
2. A device as in Claim 1 wherein said expanded beam heats said grating face producing a temperature increase in said grating face which in turn heats purge gas in a hot purge gas layer adjacent to said grating face, and a heat removal means for removing heat from said purge gas layer to reduce optical distortion caused by said hot purge gas layer.
3. A device as in Claim 2 wherein said heat removal means comprises a purge gas manifold having a plurality of small ports for directing purge gas across the grating face.
4. A device as in Claim 3 wherein said heat removal means comprises a grating purge gas flow control means for controlling purge gas flow across the grating face.

5. A device as in Claim 4 wherein said purge gas flow control means comprises structures defining a flow path across said grating face and then away from said grating face.

6. A device as in Claim 2 wherein said heat removal means comprises a purge gas manifold having at least one long very narrow slot.

7. A device as in Claim 6 wherein said slot is in the form of a long rectangular shaped nozzle.

8. A device as in Claim 3 wherein said helium purge gas flow through said manifold is less than 20 liters per minute.

9. A device as in Claim 1 wherein said helium purge gas flow is about 2 liters per minute.

10. A device as in Claim 1 and further comprising a vacuum pump for creating a vacuum in said chamber.

11. A device as in Claim 10 wherein said vacuum is a pressure of about 1 to 10 millibars.

12. A device as in Claim 10 wherein said vacuum is chosen so that gas molecules inside said chamber have a mean free path of between 5 cm and 30 cm.

13. A device as in Claim 1 and further comprising a feedback grating curvature control mechanism for providing active control of curvature of said grating face.

14. A device as in Claim 1 and further comprising a fan and at least one manifold configured to force a flow of helium gas across the grating face.

15. A method of bandwidth control of a narrow band gas discharge laser having a grating based line narrowing unit with a grating defining a grating face comprising the step of forcing a flow of gas across said grating face.

16. The method as in Claim 1 wherein said gas flow is less than 20 liters per minute.

17. The method as in Claim 16 wherein said gas flow is between 1 and 8 liters per minute.